



... a genuinely ecological strategy is the only fundamental anti-poverty approach possible in the present and future world.

Arthur Pearl

Social Policy, September-October 1971

Forum

Microbes Battle Back

The bacteria most likely to infect hospital patients are beginning to display an ability to resist the antibiotic vancomycin, the last available line of defense in the human battle against such microbes. Many *Staphylococcus aureus* strains have already developed resistance to commonly used antibiotics such as penicillin and methicillin, and for nearly two decades vancomycin has been the only certain way to thwart an *S. aureus* infection. Now it seems that the microbe is adapting resistance to vancomycin, which may leave only experimental new antibiotics to stop a public health crisis.

The new super-resilient strain of the bacterium was discovered in May 1996 at the Juntendo University hospital in Tokyo, where it had infected a 4-month-old boy recovering from heart surgery. Japanese health officials reported the finding in May 1997 and provided an isolate of the bacterium to the U.S. Centers for Disease Control and Prevention, which confirmed the resistance profile, reporting in the 11 July 1997 issue of *Morbidity and Mortality Weekly Report* that the bacterium exhibited low-level resistance to vancomycin. "Clinically, it showed decreased susceptibility. . . . It was not completely resistant to vancomycin," explains Michael Edmond, a hospital epidemiologist at the Medical College of Virginia in Richmond. "That means that the clinical outcome will depend on the site of the infection. How effective the treatment is really depends on how much vancomycin can be introduced into that area. In this case . . . the child had a wound infection, which is a case where enough vancomycin can be used to eliminate the infection. An infection in a place like the cerebral spinal fluid would be particularly hard to treat."

S. aureus infections of the cerebral spinal fluid are not common, but the discovery of this new strain hints that strains that are fully resistant to vancomycin and that could not be effectively treated in any location are emerging. Their emergence could give rise to

a situation similar to that before the advent of antibiotics—when *S. aureus* was an extremely deadly germ.

S. aureus is commonly found on the skin and can live harmlessly in the nasal passages and pudendum. But, when the bacteria overgrow, enter the bloodstream, or produce a toxin, they can cause skin pustules, toxic shock syndrome, blood stream infections, pneumonia, and death.

Because it is so prevalent, *S. aureus* is also the most common cause of surgical-site infections in hospitals. This makes the development of a completely antibiotic-resistant strain particularly worrisome for public health workers.

And, says Edmond, "If we can't control it in the hospitals, it could easily spread out into the community."

Antibiotic resistance rises from genetic changes in the bacterium that either make it impenetrable by the antibiotic or that allow it to produce a chemical that reacts with the antibiotic, rendering the antibiotic harmless. Once one bacterium has developed such a resistance, it can be passed on to other bacteria either by transformation (a form of genetic recombination resulting in an exchange of DNA between microbes) or through plasmids (specialized rings of DNA that travel from microbe to microbe). Plasmids have been known to carry the information for resistance to four different antibiotics at once.

Hospital personnel may also be contributing to the likelihood that resistant *S. aureus* strains will develop and flourish. "The problem is that vancomycin is commonly used in hospitals, and it may have been overused," Edmond says. If the antibiotic is used on an infection where only a few of the bacteria are resistant to it, all but the vancomycin-resistant strain will die, leaving that strain to grow and reproduce with little competition. *S. aureus* is also a hardy bacterium that can survive outside of the body for weeks and travel considerable distances through the air, making it very easy to spread the infection.

Edmond was one of many health professionals who predicted the advent of van-

comycin-resistant *S. aureus*. The bacterium has been efficient in defeating other antibiotics. For example, it developed resistance to penicillin in 1947, just four years after drug companies had begun mass-producing the medicine. Other common bacteria, including enterococcus, a common parasite in the human gut, have already developed vancomycin-resistant strains, and it seemed only a matter of time before this resistance was passed on to *S. aureus*. In 1992, a British researcher observed such a transfer take place in the laboratory, but until this year, no vancomycin-resistant *S. aureus* had been observed in the wild.

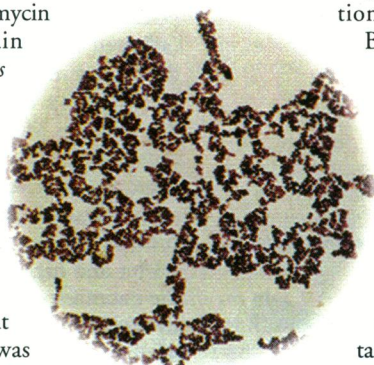
The Japanese doctors who discovered the resistant strain vigorously treated the infection with vancomycin, the antibiotic ampicillin/sulbactam, and arbekacin, an aminoglycoside approved for use against methicillin-resistant *S. aureus* in Japan but not in the United States. The organism tested negative for the genes responsible for vancomycin resistance in enterococci; the mechanism by which this strain was able to withstand vancomycin is still under investigation.

Secondhand Smoke and Heart Disease

Women who have never smoked but who are regularly exposed to cigarette smoke at home or at work are almost twice as likely to develop coronary heart disease as women who are not exposed to tobacco smoke, according to a study in the 20 May 1997 issue of the journal *Circulation*. This latest study is another black eye for the already embattled tobacco industry and new ammunition for individuals claiming that they have been unfairly harmed by so-called secondhand tobacco smoke.

Over a dozen studies have been undertaken to assess the relationship between environmental tobacco smoke and coronary heart disease, but this is the strongest association yet observed. Other studies have found that nonsmokers exposed to environmental tobacco smoke increase their risk of coronary heart disease by 20–30%, although some studies have not been able to find any statistically significant excess risk associated with exposure to environmental tobacco smoke.

The authors of the latest study contend, however, that their research improves upon



Staphylococcus aureus



New evidence. A recent report shows a strong link between secondhand smoke and coronary heart disease.

past efforts because they consider exposures to environmental tobacco smoke both at work and at home, while nearly all other studies have looked at exposures in only one location. Also, the authors adjusted for a broad range of risk factors for coronary heart disease, many of which could have confounded the results of past studies. Among these risk factors were age, alcohol intake, weight, hypertension, diabetes, cholesterol levels, menopausal status, use of postmenopausal hormones, use of oral contraceptives, exercise, saturated fat intake, vitamin E intake, aspirin intake, and parental history of myocardial infarction.

After adjusting for such factors, the authors found that, compared to women who reported no exposure to secondhand smoke, women occasionally exposed had a 58% greater chance of developing coronary heart disease, and women regularly exposed to smoke had a 91% greater chance of developing the disease. Ichiro Kawachi, an assistant professor of medicine at Harvard Medical School and the lead author of the study, called the results "startling."

Kawachi and colleagues at Harvard and at Brigham and Women's Hospital in Boston conducted the prospective study on a cohort of 32,046 women between the ages of 36 and 61 who were already participants in Harvard's Nurses' Health Study. In 1982, the women were asked about their exposure to secondhand tobacco smoke. The cohort was then followed until 1992 with study endpoints consisting of nonfatal myocardial infarction and fatal coronary heart disease.

A weakness of the study, concede the authors, was its reliance on the subjects to determine if they were regularly exposed, occasionally exposed, or not exposed to secondhand smoke. Also, this exposure evaluation was made only once at the beginning of the 10-year study period. The authors conclude that these circumstances would be likely to weaken the association between expo-

sure to environmental tobacco smoke and heart disease. This is because smoking was banned from many hospitals during the study period, so nurses in the study group probably reported higher exposures at baseline than they would have toward the end of the study.

The results of the study may lend support to the claims of a group of flight attendants who brought suit in May against cigarette manu-

facturers for illnesses they attribute to years of exposure to environmental tobacco smoke in airplane cabins. The study could also strengthen the hand of 31 states' attorneys general who are trying to reach an out-of-court settlement with the tobacco companies for reimbursement of state Medicaid funds used to treat smokers. The proposed settlement between the attorneys general and cigarette manufacturers would give the tobacco industry limited protection against lawsuits such as that brought by the airline attendants. But it must first be approved by Congress and the president, who has voiced objection to the restraints that the deal places on the Food and Drug Administration to regulate tobacco as a drug in the future.

Are Privilege and Immunity Laws Fair?

In 1993 Oregon passed a law—the first of its kind in the United States—that allows companies to keep secret the results of any voluntary environmental inspections as long as the firms promptly correct any violations of environmental laws and regulations turned up by these audits. As of May 1997, 21 other states had put similar "environmental audit" legislation on their books, and 13 more states are considering environmental privilege and immunity legislation. Some of these laws have also added provisions granting immunity from prosecution for environmental violations to companies that disclose environmental problems to regulators and promptly remedy them.

A major reason behind such legislation, says Christopher Rich, an attorney with the Oregon Department of Environmental Quality, is the growing complexity and volume of environmental regulations. "Because of this [regulatory] burden, the ability to find violations has increased significantly, and many would argue that it is almost

physically impossible to comply with all the regulations on the books," he says. In response to this change, industries often undertake audits to ensure they are complying with current legislation. But such audits can be expensive and time-consuming. In addition, they create a so-called "paper trail" that would be available to the public. According to Jim Moore, a Seattle attorney who works with businesses, such audits "create a record that someone who is motivated out of political aspirations can use against a company." Laws that allow companies to keep this information privileged are an attempt to address such potential abuses of information, he says. This type of legislation is endorsed by business organizations such as the National Association of Manufacturers and the Colorado Association of Commerce & Industry, a major sponsor of the Colorado audit privilege law (the second such law in the United States), which is being used as a model for most subsequent audit privilege legislation.

The opposition to privilege and immunity laws, particularly by public interest groups, is enormous and heated. The laws' critics see them as a huge threat to public health and property. Ross Vincent is chairman of the Sierra Club's Environmental Quality Strategy Team and is responsible for coordinating the organization's opposition to audit privilege legislation, nationally and locally. Says Vincent, "Audit privilege laws threaten lives . . . by shielding environmental lawbreakers from prosecution. They also allow unscrupulous operators to conceal from the public, from prosecutors, and from the courts essential information about releases and exposures involving the huge universe of unregulated toxins. . . . They create an effective shield that will very likely encourage some polluters to report violations only selectively, thus committing criminal violations with fair confidence that they will not be caught. They remove some of the most important 'bottom line' incentives for investment in innovative technologies and practices, and for improved performance beyond mere compliance. And," he concludes, "they interfere with the ability of people harmed by unregulated pollution to recover damages from the responsible parties."

Thomas Lindley, an Oregon lawyer who was instrumental in writing that state's privilege legislation, argues that the laws don't really keep information secret from the public. For example, he notes, they don't protect information that must be reported to the EPA. But that fact doesn't reassure Mark Woodall, who heads the Sierra Club's task force opposing this legislation. "That's of little consequence to us," he says. "There's just a tremendous amount of information about